ACCESSIBLE WHEELCHAIR USING BLUETOOTH AND ARDUINO

MINOR PROJECT-1 REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this Minor project-1 report entitled **"ACCESSIBLE WHEELCHAIR USING BLUETOOTH AND ARDUINO"** is the bonafide work of **PRADEEPA G (21UEEA0101), V ADITYA (21UEEA0230) and VAISHNAVI K (21UEEA0130)** who carried out the project work under my supervision.

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ABSTRACT

Voice Controlled Wheel Chair for people who has any physical illness. Here Arduino, micro controller voice recognition module are used to support the motion of the wheelchair. In order to provide the battery level, a battery level indicator is also provided. Based upon the direction specified in the commands, the Arduino will drive the 2 motors. People those who has disabilities with their hands, foot and lower body are unable to perform tasks on regular basis. So, there are many applications which help handicapped person to perform their tasks. The aim of this system to help people who cannot move properly without help others due to any physical illness or disabilities. Speech recognition technology will provide a new way of human interaction with machine.

Speech recognition technology will provide a new way of human interaction with machine.Advancements in technology have opened up new avenues for assisting individuals with physical disabilities. Among these innovations is the Voice Controlled Wheelchair, a project designed to empower people facing mobility challenges due to physical illnesses or disabilities affecting their hands, feet, or lower body.A voice recognition module,this system offers a novel solution for controlling the wheelchair's movement through voice commands. Additionally, it incorporates a battery level indicator to ensure continuous operation and user safety.

Wheelchairs cater to the needs of many individuals with disabilities, there remains a segment of the disabled community for whom such solutions are impractical or inaccessible. In response, this paper presents the design of a smart, motorized, voice-controlled wheelchair aimed at addressing the mobility challenges faced by physically disabled individuals.The proposed design integrates an embedded system to enable voice activation, complemented by manual operation capabilities.The significance of such a system lies in its ability to provide individuals with disabilities a greater degree of independence and autonomy in their daily lives. By enabling users to interact with the wheelchair using speech recognition technology, the project aims to alleviate the reliance on external assistance and enhance the overall quality of life for those with mobility impairments.

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 VOICE CONTROLLED WHEEL CHAIR

A wheelchair is used when it is impossible to walk due to physical illness or disabilities. There are various kinds of wheelchairs which meet the various needs of their users.Several studies have resulted that for independent mobility to all the disabled human. The motive is to help such people to live an independent life without depending on others. The wheelchair is navigated in the four directions. By using the voice recognition module, the user can control the movement of the model by sending voice commands such as forward,reverse,left, right and stop. In order to provide the level of battery,a battery level indicator is also provided.Generally, the communication port is the parallel port which takes the commands given to the wheel chair in the form of electrical signals. Four wheels are used in the wheel chair for proper balancing. The movement of wheels is controlled by car wiper motors which are attached to the wheel chair. The micro controller based control systems are presented for disabled persons.

Figure 1.1: Voice control wheel chair

The Control Wheelchair project represents a convergence of cutting-edge technology and compassionate design, aimed at enhancing the independence and quality of life for individuals with mobility impairments. By harnessing the power of embedded systems, voice recognition technology, and intelligent control algorithms, this initiative seeks to empower users with a seamless and intuitive means of navigating their environments.Sanitation facility is very poor condition having only 29% national coverage and issue on water quality has not been given proper attention (Shrestha et.al, 2203). Rural communities continue to use the most convenient source of water irrespective of quality.

Regular outbreaks of water borne epidemics and increasing number of patients being admitted to hospitals due to water related diseases indicates that only supplying of drinking water is not sufficient to improve public health status unless continued effort is made both on water supply and sanitation.The Voice Control Wheelchair project merges advanced technology with compassionate design, focusing on improving the independence and well-being of individuals with mobility impairments. By leveraging embedded systems, voice recognition technology, and intelligent control algorithms, the project empowers users with a straightforward and intuitive voice-controlled navigation system

1.1.1 Implementation Platform

Hardware Requirement

Arduino UNO

L293N Motor

Bluetooth Module HC-05

Ultrasonic Sensor HC-SR-04

Wheel chair chassis

Battery 12 volts

2 DC Motors (12 V 200 rpm)

Power supply

1.1.2 Software Requirement Coding language

Arduino IDE

Android Application

Arduino programming (java C++)

1.1.3 Voice Control Commands

The project seamlessly integrates Arduino micro controllers into the wheelchair system, providing a robust platform for controlling and managing various functions. These micro controllers serve as the brain of the wheelchair, processing input commands from the voice recognition module and coordinating the movement of motors and actuators

Voice Recognition Technology Utilizing advanced voice recognition technology, the wheelchair can interpret spoken commands from the user with high accuracy. By incorporating a dedicated voice recognition module, the system can understand and respond to a wide range of voice commands, allowing users to control the wheelchair's movement, speed, and direction through natural speech.

Figure 1.2: Voice control commands

1.2 Bluetooth module HC-05

The HC-05 module operates in two modes: Command Mode and Data Mode. In Command Mode, AT commands can be sent to the module for configuration and control purposes. In Data Mode, the module transmits and receives data to and from other Bluetooth modules, enabling wireless communication between devices.motor HC05 is a Serial Bluetooth module for Aurdino and other micro controllers operating at 5V.It has a two-way wireless functionality which is compatible with laptop or phone The main purpose of the Bluetooth series module is to replace the following port line, such as One connects to the Bluetooth control device while another one equates to a slaver means. Their

link can be created once the pair is executed. This Bluetooth link is equally liked to a serial port line agent including RXD,TXD signals. And they can communicate with each other.

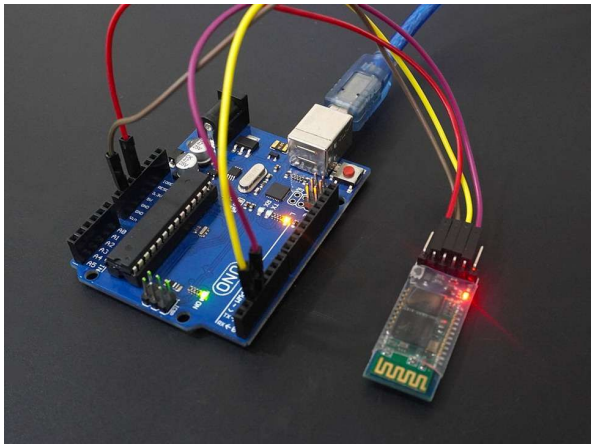

Figure 1.3: Bluetooth Module HC-05 connection to Arduino

1.2.1 Caster wheel

A caster (or castor) is an undriven wheel that's designed to be attached to rock bottom of a bigger object (the "vehicle") to enable that object to be moved. Casters are utilized in numerous applications, including shopping carts, office chairs, hospital beds, and material handling equipment. High capacity, heavy duty casters are utilized in many industrial applications, like platform trucks, carts, assemblies, and tow-lines in plants

Figure 1.4: Caster wheel

1.2.2 DC Motor

Selecting proper motors were very difficult task because we have to keep in mind the torque required, current, and speed. Very heavy motors will cause the wastage of the battery and also the speed will be maximum which will be very difficult to control. While very low motors do not fulfill our requirement and cannot move the wheelchair. Therefore these considerations were in our mind in selecting the motors. Motors come in many shapes and sizes.

Motors are undoubtedly one of the multiple important roles of a mobile robotics program. Overpowered motors generate inability and waste the already restrained supply of energy from the onboard batteries, while small motors could be low on torque at crucial times. The optimal rotation velocity and the possible speed limit of the motor requirement also be taken into thought. To high of an output rpm from the 16 motor shaft will cause the robot to operate at a fast, uncontrollable speed. Too weak of output and the robot will not be able to achieve a proper speed to match the user's requirements. The torque output of the motor also performs a role in the execution because if the torque is not enough, locomotion may not happen in some circumstances. Hence, much thought was put into the choice of the individual motor for the platform.

Motors come in various shapes and sizes. There are electromagnetic direct current (DC) motors and electromagnetic alternating current (AC) motors and plenty of varieties of each. AC motors are typically practiced for large purposes, such as machine tools, washers, dryers, etc., and are power by an AC power line. As the standard power stock for mobile robotic is a DC battery, and technology for transforming DC to AC is very expensive in both terms of monetary cost and power cost, AC motors are where ruled out as an option for the robot

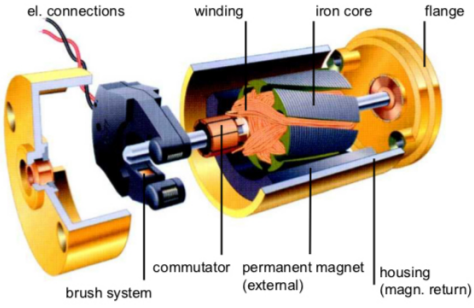

Figure 1.5: DC motor

1.2.3 Wheels

Wheels are that operate around the area‘ practicing motorized wheels to drive themselves. This study is plainer than using treads or legs and by utilizing wheels they are simpler to create, build, and program for movement in flat, not-so-rugged terrain. They are also more well-controlled

than different kinds of robots. Disadvantages of wheeled robots are that they can't navigate well over obstacles, such as rocky terrain, sharp declines, or areas with low friction.

1.2.4 Battery 12V

the development of the Voice Controlled Wheelchair project, a crucial element in ensuring uninterrupted operation is the utilization of a 12V battery. This power source serves as the lifeblood of the system, providing the necessary energy to drive the wheelchair's motors, power the Arduino microcontroller, and operate other essential components. The 12V battery, chosen for its compatibility with the wheelchair's electrical requirements, offers a reliable and portable power solution, allowing users to navigate their surroundings with confidence and autonomy. By integrating this robust power source into the project's design, the Voice Controlled Wheelchair aims to deliver a dependable and efficient mobility solution for individuals with physical disabilities, empowering them to navigate their environments with ease and independence.

Figure 1.6: Battery 12 volts

1.2.5 Ultrasonic sensor

Ultrasonic Sensors can detect an object without being influenced by its colors.For example,if two objects have the same shape, even if one is transparent, such as glass, and the other is black plastic, they can both be detected with the same settings. The ultrasonic sensor is used.Here we have used HC-SR04 Ultrasonic sensor. Whenever the wheel chair is going on the desired path the ultrasonic sensor transmits the ultrasonic waves without intruption.When obstracle comes into the path,the sensor's wave is reflected by the object and the dis countinouty in the reception of ultrasonic wave information is passed to the micro controller.The distance of obstacle is continuously stop.

Figure 1.7: Ultrasonic sensor

1.2.6 Motor driver L293N

L293D is a standard Motor driver or Motor Driver IC which enables DC motor to drive on either way. L293N is a 16-pin IC that can command a set of two DC motors concurrently in any way.It works on the concept of H-bridge. H-bridge is a circuit which enables the voltage to be navigated in either direction.As you understand, voltage needs to change its direction for rotating the motor in clockwise or anticlockwise direction; hence, H-bridge IC is ideal for driving a DC motor.In a single L293D chip there are two h-Bridge circuit inside the IC which can turn two dc motor separately. Due its dimension it is very much used in robotic application for regulating DC motors. Given underneath is the pin design of a L293N motor controller.

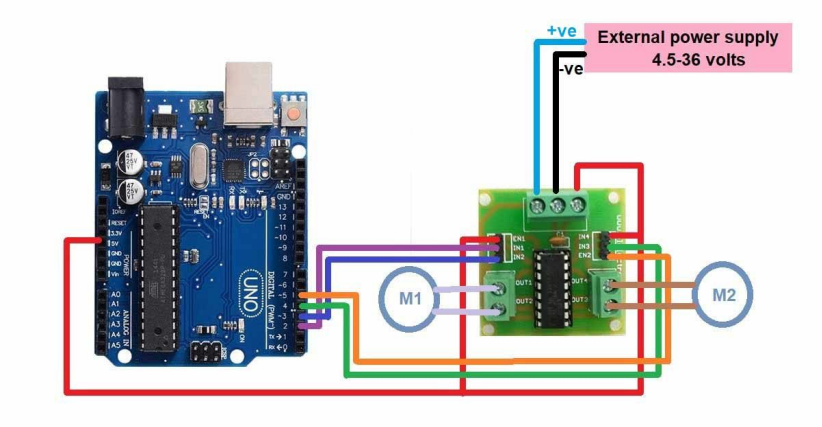

Figure 1.8: L293N connection to arduino

1.2.7 Arduino UNO

Arduino is an Open-source-electronic-prototyping-base for simple used hardware and software in the field of micro-controlling. A microcontroller (MCU for microcontroller unit or UC for -controller) is a little processor on a separate integrated circuit. In modern language, it is comparable to but less complicated than, a system on a chip (SoC). A microcontroller comprises one or higher CPUs

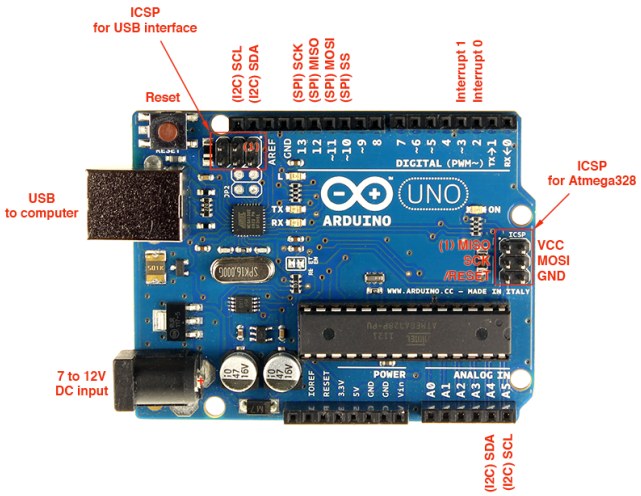

Figure 1.9: Arduino UNO

(processors core) accompanying with memory and programmable input/output peripherals.Program memory in the form of ferro electric.It has 16 MHz crystal, 6 analogue input and output pins, 14 digital input output pins and out of which 14 digital pins 6 pins can be used as PWM pins that are pretty accommodating in motor control applications.

1.2.8 Emergency Stop Mechanism

Redundant emergency stop buttons or switches may be installed at different locations on the wheelchair to ensure accessibility in emergency situations. Mechanical latching mechanisms or electronic interlocks may be incorporated to prevent accidental or unauthorized reactivation of the wheelchair after an emergency stop has been initiated. Emergency stop systems may include visual and auditory indicators to alert users and caregivers when the system has been activated. Redundancy in the emergency stop system involves the installation of multiple emergency stop buttons or switches at different locations on the wheelchair.

These buttons or switches should be strategically positioned to ensure accessibility to both the wheelchair user and caregivers. Redundancy helps mitigate the risk of failure or obstruction of a single emergency stop mechanism, ensuring that users can quickly and easily activate the emergency stop function from various positions around the wheelchair. Mechanical latching mechanisms are mechanisms that hold the emergency stop button or switch in the activated (pressed) position until manually reset. When the emergency stop button is pressed, the mechanical latch engages, preventing accidental release and ensuring that the wheelchair remains in a halted state until intentionally reset. This feature enhances safety by preventing unintended reactivation of the wheelchair's motion following an emergency stop event

CHAPTER 2

LITERTAURE SURVEY

2.1 OVERVIEW

We have researched from several magazines, journals,websites on things and projects that have been produced related to our project. Various studies have been conducted to produce a prototype of the wireless control wheelchair. The study was performed on the sensitivity of the controller, wheelchair's movement, method and issues.

2.1.1 Developing a voice - command robotic wheelchair

Students of Massachusetts Institute of Technology, Massachusetts.The goal of this smart wheelchair project is to enhance an ordinary powered wheelchair using sensors to perceive the wheelchair's surroundings, a speech interface to interpret commands, a wireless device for room-level location determination, and motor-control software to effect the wheelchair's motion.The robotic wheelchair learns the layout of its environment (hospital, rehabilitation center, home, etc.) through a narrated, guided tour given by the user or the user's caregivers. Subsequently, the wheelchair can move to any previously-named location under voice command (e.g., "Take me to the cafeteria"). This technology is appropriate for people who have lost mobility due to brain injury or the loss of limbs, but who retain speech. The technology can also enhance safety for users who use ordinary joystick-controlled powered wheelchairs, by preventing collisions with walls, fixed objects, furniture and other people.

2.1.2 Head controlled arduino based robotic wheelchair

The study found that the head control system was a viable and effective means of controlling the wheelchair, with users reporting high levels of satisfaction and improved quality of life. In a study published in the Journal of Medical Systems, researchers investigated the use of a head-controlled robotic wheelchair by individuals with multiple sclerosis (MS) (Machangpa and Chingtham 2018).The study found that the head control system was a reliable and effective means of controlling the wheelchair, with users reporting improved mobility and decreased physical strain.The use

of Arduino micro controller boards in the development of robotic wheelchairs has gained increasing attention in recent years. A study published in the Journal of Medical Engineering and Technology investigated the use of an Arduino-based control system for a robotic wheelchair,2020).

2.1.3 Voice Controlled Wheelchair Using Arduino

Voice Controlled Wheelchair Using Arduino For those with physical disabilities, the proposed design provides voice command detection. Disability prevents an individual from being independent and forces them to rely on others for daily tasks. Instead of using buttons or gestures, the voice-controlled wheelchair has been built depending on user instructions. Because the wheelchair contains a Node Mcu micro controller with a built-in wifi module, we can operate it using the user's commands. Users provide the instructions using their smartphones. The instructions that are obtained from the microprocessor regulate how the wheelchair's motors move. With the aid of a buzzer, it alerts and informs users when an obstruction is discovered.

2.1.4 Smart Wheelchair Component System

The Smart Wheelchair Component System University of Pittsburgh, Forbes Tower, Pittsburgh We are therefore developing a modular Smart Wheelchair Component System (SWCS), shown in Figure 2, which can be added to a variety of commercial power wheelchairs with minimal modification. We envision a collection of components that can be attached to standard power wheelchairs from several different manufacturers to convert them into smart wheelchairs. The SWCS is being designed to accommodate all traditional input methods (analog joystick, touch-activated switches, pneumatic "Sip n' Puff" switches, etc.) and to be compatible with multiple brands of wheelchairs.

2.1.5 Voice Controlled Intelligent Wheelchair

In order to assist physically handicapped persons, we developed a voice controlled wheelchair. The user can control the wheelchair by voice commands, such as "susume (run forward)" in Japanese. A grammar-based recognition parser named "Julian" is used in our system. Three type commands, the basic reaction command, the short moving reaction command, and the verification command, are given. We experimented speech recognition by Julian, and obtained a successful recognition rate 98.3 to 97.0 of the movement command and the verification command, respectively. The running experiment with three persons was carried out in the campus room and the utility of our system is shown

2.1.6 literatures on affordable robotic wheelchair

Another example is the "WeWALK" smart cane, which was developed by a Turkish start-up and can be attached to any standard wheelchair to provide advanced navigation and obstacle detection

features at an affordable price (Frizziero et al., 2021). These affordable robotic wheelchairs offer significant benefits to disabled individuals, particularly those living in lowand middle-income countries, where access to expensive assistive devices is limited. For example, a study conducted by researchers at the University of Rwanda found that the use of a low-cost, motorized wheelchair improved the quality of life and social inclusion of disabled individuals in the country (Mairami et al., 2018). The development of affordable robotic wheelchairs has the potential to significantly improve the mobility and independence of disabled individuals, particularly those living in low- and middle-income countries. While further research is needed to improve the functionality and usability of these devices, they represent an important step towards improving access to assistive technology for disabled individuals around the world.

2.1.7 Prior research on head controlled arduino based robotic wheelchair

A study published in the Journal of NeuroEngineering and Rehabilitation investigated the use of a head-controlled robotic wheelchair by individuals with high-level spinal cord injuries (SCIs) (Kumar Kumar 2015).. The study found that the headcontrolled system was an effective means of controlling the wheelchair, with users reporting improved mobility and independence. Another study published in the Journal of Rehabilitation Research and Development evaluated the use of a headcontrolled robotic wheelchair by individuals with cerebral palsy (CP) (Prasad et al., 2017). The study found that the head control system was a viable and effective means of controlling the wheelchair, with users reporting high levels of satisfaction and improved quality of life. In a study published in the Journal of Medical Systems, researchers investigated the use of a head-controlled robotic wheelchair by individuals with multiple sclerosis (MS) (Machangpa and Chingtham 2018). The study found that the head control system was a reliable and effective means of controlling the wheelchair, with users reporting improved mobility and decreased physical strain.

2.1.8 Wheelchair Neuro Fuzzy Control and Tracking System Based on Voice Recognition

Autonomous wheelchairs are important tools to enhance the mobility of people with disabilities. Advances in computer and wireless communication technologies have contributed to the provision of smart wheelchairs to suit the needs of the disabled person. This research paper presents the design and implementation of a voice controlled electric wheelchair. This design is based on voice recognition algorithms to classify the required commands to drive the wheelchair. An adaptive neuro-fuzzy controller has been used to generate the required real-time control signals for actuating motors of the wheelchair. This controller depends on real data received from obstacle avoidance sensors and a voice recognition classifier. The wheelchair is considered as a node in a wireless sensor network in order to track the position of the wheelchair and for supervisory control. The simulated and running experiments demonstrate that, by combining the concepts of soft-computing and mechatronics, the

implemented wheelchair has become more sophisticated and gives people more mobility.

2.1.9 Voice Controlled Wheel Chair

The elderly, as well as millions of other people, suffer from paralysis and disability, which makes them physically unable to interact normally and adhere to the demands of life. Wheelchairs are important tools to enhance the mobility of persons with disabilities. Developments in computers and communications technologies have contributed to the availability of smart wheelchairs that meet the requirements of a disabled person. In order to help the handicapped to carry out their daily work, many attempts have been made to apply modern technologies in computers and communications to build smart wheelchairs that suit their needs. These wheelchairs need to be equipped with a real-time computer control unit and a set of sensors for navigation and obstacle avoidance tasks. A disabled person can control a wheelchair by simply moving a part of the body, using sound or brain signals. The method of generating commands for guiding the wheelchair depends mainly on the patient's condition and degree of disability or paralysis. In our previous research, the brain-computer interface based on electrooculography (EOG) signals was used to control an electric wheelchair. In this paper, the voice will be used in guiding the wheelchair. Voice recognition has gained increasing importance in computer-controlled applications. Voice recognition techniques evaluate the voice bio metrics of a person, such as the frequency, flow of voice, and accent.

2.1.10 Voice controlled wheelchair for physically disabled people

Most of the disabled people usually depend on others in their daily life especially in moving from one place to another. For the wheel chair users, continuously they need someone to help them in getting the wheelchair moving. By using a wheelchair control system they become more independent. This research project is to design and fabricate a voice controlled wheelchair for physically disabled people. The wheelchair control system which deploys a voice recognition system for triggering and controlling all its movements. It integrates a microcontroller, voice recognition through Google assistant, motor control interface board to move the wheelchair. By using the system, the users are able to operate the wheelchair by simply speaking and commanding through Google assistant. The basic functioning process includes forward and reverse direction, left and right turns and stop. It uses a PIC controller manufactured by Microchip Technology to control the system operations. It communicates with the voice recognition through Google assistant and works with the commands which is saved as the number system directed from the Ada-fruit cloud. The speech is given and then determines the corresponding output command to drive the left and right motors. To finish this task, an assembly language program is written and stored in the controller's memory.

CHAPTER 3

METHODOLOGY

3.1 OVERVIEW

The voice-controlled wheelchair system is designed to provide individuals with mobility impairments an intuitive and accessible means of navigating their wheelchairs using voice commands. The system comprises several key components working together to enable seamless communication between the user and the wheelchair actuators

3.1.1 User Interface Module

The user interface module serves as the point of interaction between the wheelchair user and the system. It typically consists of a microphone or a dedicated voice input device. Users issue voice commands to control the wheelchair's movements, such as moving forward, backward, turning left or right, and stopping. The voice commands captured by the user interface module are transmitted wirelessly to the control module using Bluetooth communication.

3.1.2 Voice Customization Module

The Voice Customization Module is responsible for training the system to recognize a set of predefined voice commands. Users customize the system by providing training samples for each command, such as "FRONT," "BACKWARD," "RIGHT," "LEFT," and "STOP." These training samples are used to create models that identify the unique characteristics of each command's speech frequency.

3.1.3 Control Module

The control module, based on an Arduino microcontroller, acts as the central processing unit of the system. Upon receiving voice commands from the user interface module via Bluetooth, the Arduino interprets and processes these commands. The control module contains the Voice Customization

Figure 3.1: Control Module phone

and Voice Recognition sub-modules responsible for training the system to recognize specific voice commands and executing corresponding actions.

3.1.4 Voice Customization Module

The Voice Customization Module is responsible for training the system to recognize a set of predefined voice commands. Users customize the system by providing training samples for each command, such as "FRONT," "BACKWARD," "RIGHT," "LEFT," and "STOP." These training samples are used to create models that identify the unique characteristics of each command's speech frequency.

3.1.5 Voice Recognition Module

The Voice Recognition Module compares the received voice commands with the predefined commands stored in the microcontroller. Upon successful recognition of a command, the Voice Recognition Module triggers the corresponding actions to control the wheelchair's movement. In addition to basic navigation commands, the module also incorporates safety features such as obstacle detection and emergency stop mechanisms.

3.1.6 Wheelchair Actuators

The wheelchair actuators, typically motorized wheels, receive control signals from the control module to execute the desired movements. Based on the recognized voice commands, the control module sends appropriate signals to the wheelchair actuators to move the wheelchair forward, backward, turn left or right, or stop.

3.1.7 Materials and Method

To fabricate a realistic voice controlled wheelchair, various kinds of equipment are necessary. At first wheelchair is made mechanically or by the installation of mechanical equipment/parts. Secondly, electrical equipment/components are designed for using in the wheelchair and after installing these in the mechanical wheelchair, the mechanical wheelchair now is turned to an electrical wheelchair. Here some brief idea about the equipment/components used to construct the wheelchair and their installation. Wheel a wheel is a circular component that is intended to rotate on an axial bearing. The wheel is one of the main components of the wheel and axle which is one of the six simple machines.

Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load, or performing labor in machines a caster (or castor) is an unproven, single, double, or compound wheel that is designed to be mounted to the bottom of a larger object (the "vehicle") so as to enable that object to be easily moved. They are available in various sizes, and are commonly 8 made of rubber, plastic, nylon, aluminum, or stainless steel. Casters are found in numerous applications, including shopping carts, office chairs, and material handling equipment. Generally, casters operate well on smooth and flat surfaces. DC Motor: a dc motor is an electric machine that converts electrical energy into mechanical energy. The reverse conversion of mechanical energy into electrical energy is done by an electric generator.

In normal motoring mode, most electric motors operate through the interaction between an electric Motor's magnetic field and winding currents to generate force within the motor. In certain applications, such as in the transportation industry with traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy. The movements of the wheelchair are controlled with the help of an Android application.This component represents the device (e.g., smartphone or tablet) through which the user interacts with the wheelchair system, issuing voice commands. Graphical User Interface (GUI) is provided via the application to the user to control the wheelchair movements The above figure is the block diagram of Andro voice chair. The proposed system uses touch-screen -based android mobile to control the wheelchair.

An android application is to be developed for this purpose. The android mobile is connected to microcontroller fitted inside wheelchair via Bluetooth controller. The provided application gives simple user interface to the user for selection of direction for motion of wheelchair. Based on selected input, the corresponding signal is sent via Bluetooth controller to microcontroller, which takes actions as a form of output. If the user selects the front direction, than both the motors are made to move in the same direction and with same speed. Similarly is for the reverse direction.

3.1.8 Block diagram

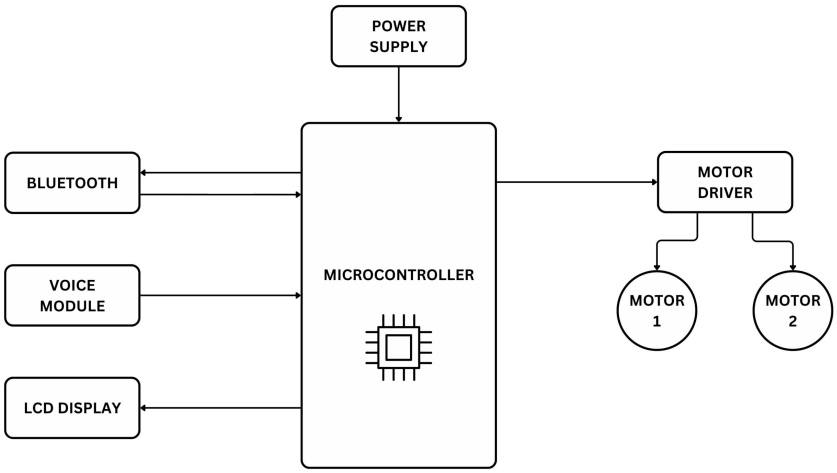

Figure 3.2: Block diagram

3.1.9 Electronic System Configuration

The block diagram of the electronic system it has been conceived as an open and adaptable modular system. In this way, an eventual addition could be made just by adding a board with the desired function. The main blocks in the system are as follows: 1) Speed and direction control (driver circuits)

2) Power and Activation Motor Unit.

3) Speech Recognition Unit.

4) Arduino Board.

The system has a flexible configuration and is easily up gradable. More features can be added by merely changing/adding specific boards. The different blocks of the present system use 8-bit micro-controllers

CHAPTER 4

CONCLUSION

4.1 MECHANICAL DESIGN OF THE WHEELCHAIR

A force is the amount one object tries to push or pull another object. The earth exerts a force on every object, pulling it towards the ground. This is known as the force due to gravity, and the center of gravity of an object is the point where it can be balanced. Building wheelchair system basically based on mechanical studying. There are two mechanical parts have been studied in this project, the dimensions of all parameters (seat, motors, wheels, gear, batteries and drive kit), the other part was the power calculations. Operation of the Wheelchair: in this system some advanced voice commands are designed so that the user can choose the speed. The user can select the speed in two levels, either slow or fast speed to move.

The user need only to move in a short distance or to approach object, he should use the slow speed. This speed selection is important for safety and extra maneuverability of the user. The main part of the design is to control the motion of the wheelchair. The working principle of the wheel chair based on the voice recognition. There are four types of motions considered, moving forward, moving in reverse direction, moving to the left and moving to the right. For the speed, the user may use slow or fast speed. Slow speed is important as the user want to move in short distance or approaching an object. The system starts by applying the supply voltage to the speech recognition circuit. The system will be in stand by condition in which the LED on circuit recognition board will be turned on. The direction and speed of the wheelchair depends on the user. For the forward command the wheelchair moves in forward direction.

For the reverse direction the opposite movement of wheel rotation will occur. The left command will make right wheel moves forward and left wheel moves backward. The right command makes left wheel moves forward and right wheel rotate backward. In this system, by assigning the word command 16 stop the rotation of both motors will stop. The wheelchair system will go back to the stand by condition or end the whole system by turning off the power supply of the speech recognition board,

the weight of wheelchair contains the weight of seat, wheels, motors, batteries and motor drive. The system can be controlled in two speed conditions, fast and slow. For fast condition the system will supply higher current to the motors. If the user does not want the wheelchair to move in high speed, the slow speed can be set by applying low current supply to the motors

4.1.1 Future Ehancements

The weight of the load for this system must be below 50 kilogram so that wheelchair only can function properly, weight lifting capacity to be increased.
ii) Obstacle avoidance sensors can be interfaced.
iii) Home appliance control circuit can interfaced along with wheel chair control

4.1.2 Complete list of voice commands for controller interface

1.CONTROL: This is a "Mode" command which starts the manual control of the wheelchair

2.GO : This is a "Mode" command which starts the automatic control of the wheelchair.

3.STOP : This command terminates any operating control mode and stops the wheel chair immediately. After the stop command is given the voice recognition process performs a self-test and restarts in a neutral mode.

4.FORWARD : This is a direction command that will set the direction of the movement for the wheelchair Reverse: This is a direction command that will set the direction of the movement for the wheel chair reverse.

5. RIGHT : This is a direction command that will set the direction of the movement for the wheel chair to right.

6.LEFT : This is a direction command that will set the direction of the movement for the wheelchair to left

4.1.3 Software Quality attributes

Software Quality attributes are the overall factors that affect run-time behaviour, system design and user experience. They represent the areas of concern that have the potential for application wide impact across layers and tiers. Some of these attributes are related to the overall system design, while others are specific to run time, design time, or user related issues. The extent to which the application possesses a desired combination of quality attributes such as usability performance, reliability and security indicates the success of the design and the overall quality of the software application. When designing applications to meet any of the quality attribute requirements, it is necessary

to consider the potential impact on other requirements. One must analyze the trade offs between multiple quality attributes. The importance or priority of each quality attribute differs from system to system. 1)Functionality : Recognising the voice commands, processing the commands according to the moments and fetching it to the robotic vehicle.

2) Reliability : Maturity and accuracy.

3) Usability : Fast processing and moving robotic vehicle according to command.

4) Efficiency : Accurate matching and quick processing.

5) Maintainability : None except for factory updates.

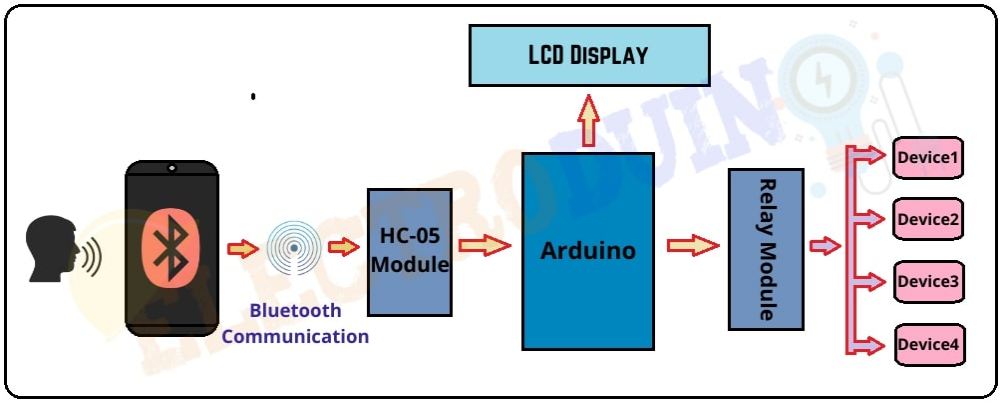

Figure 4.1: Voice controller

4.2 Simulation Result

The project will begin once the power is turned on. The mobile module in the project must be linked to the Bluetooth module. We offer wheelchairs that are controlled by voice using smart phone apps. It may be simply moved to the desired location with the use of a voice command and a switch. The below image is showing the total system is in OFF mode.

4.2.1 Result

The simulation of the voice-controlled wheelchair system has been instrumental in evaluating its functionality, performance, and user experience. Through meticulous testing and analysis, we have gained valuable insights into the system's capabilities and limitations.

Our findings indicate that the system effectively interprets voice commands, executes precise wheelchair maneuvers, and prioritizes user safety. Users have expressed satisfaction with the system's ease of use and responsiveness, underscoring its potential to enhance mobility and quality of life for individuals with disabilities. Moreover, the simulation process has identified areas for refinement and optimization, particularly in voice recognition accuracy, motion control algorithms, and obstacle detection mechanisms.

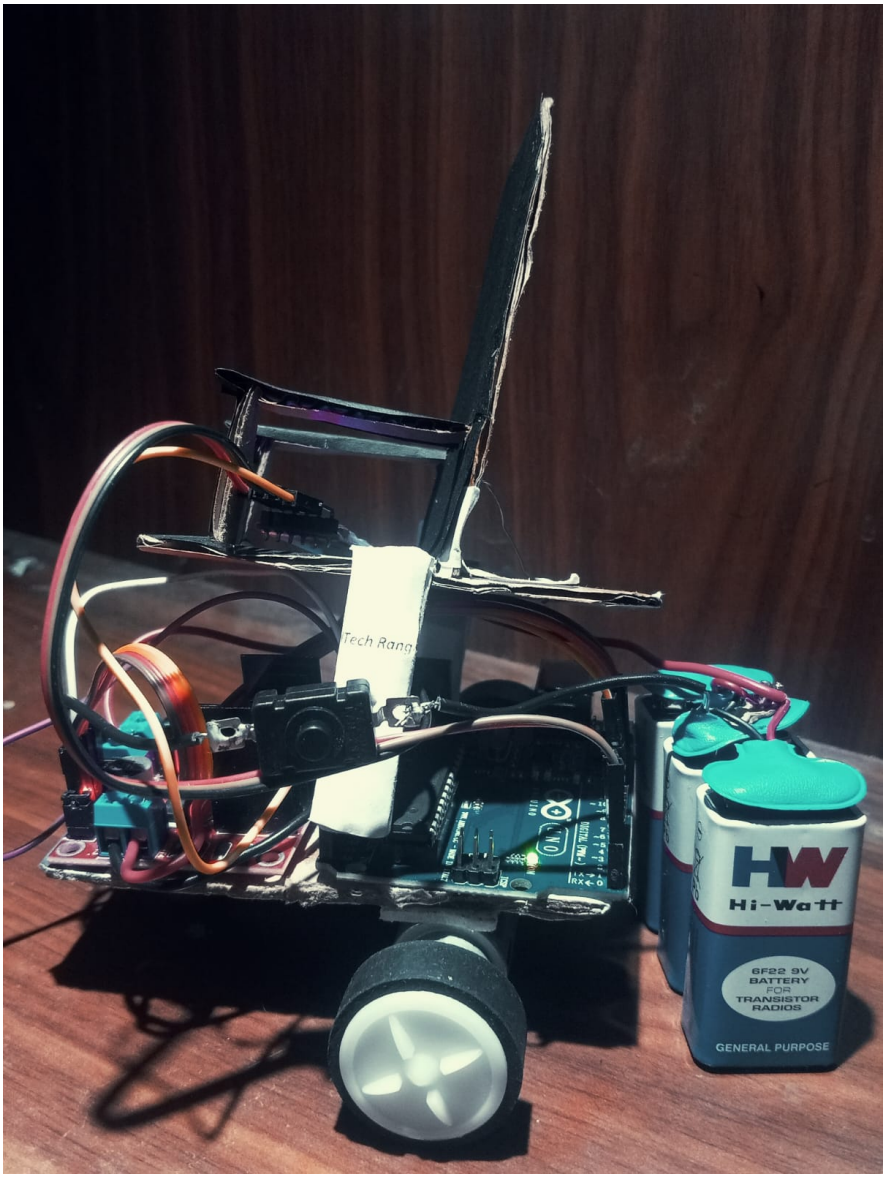

Figure 4.2: Voice controller wheel chair

By addressing these areas, we can further elevate the system's performance and usability, ensuring its reliability and effectiveness in real-world scenarios. In conclusion, the simulation results validate the viability of the voice-controlled wheelchair system as a practical and empowering solution for individuals with mobility impairments. By continuously refining and enhancing its design, we can continue to advance accessibility and independence for users, ultimately improving their overall well-being and quality of life.

4.2.2 Wheel chair system

Our smart wheel chair project uses voice control, which can be accessed via a mobile phone via a set of Android Apps. We've developed the Android applications' functions to change the sys-

tem control with a single tap The advantages of this work are simple-to-control, easy to use, nobody needs a medical specialist to run it, we can use it at home, cheap installation costs, dependable in an emergency.

4.2.3 Wheel chair system

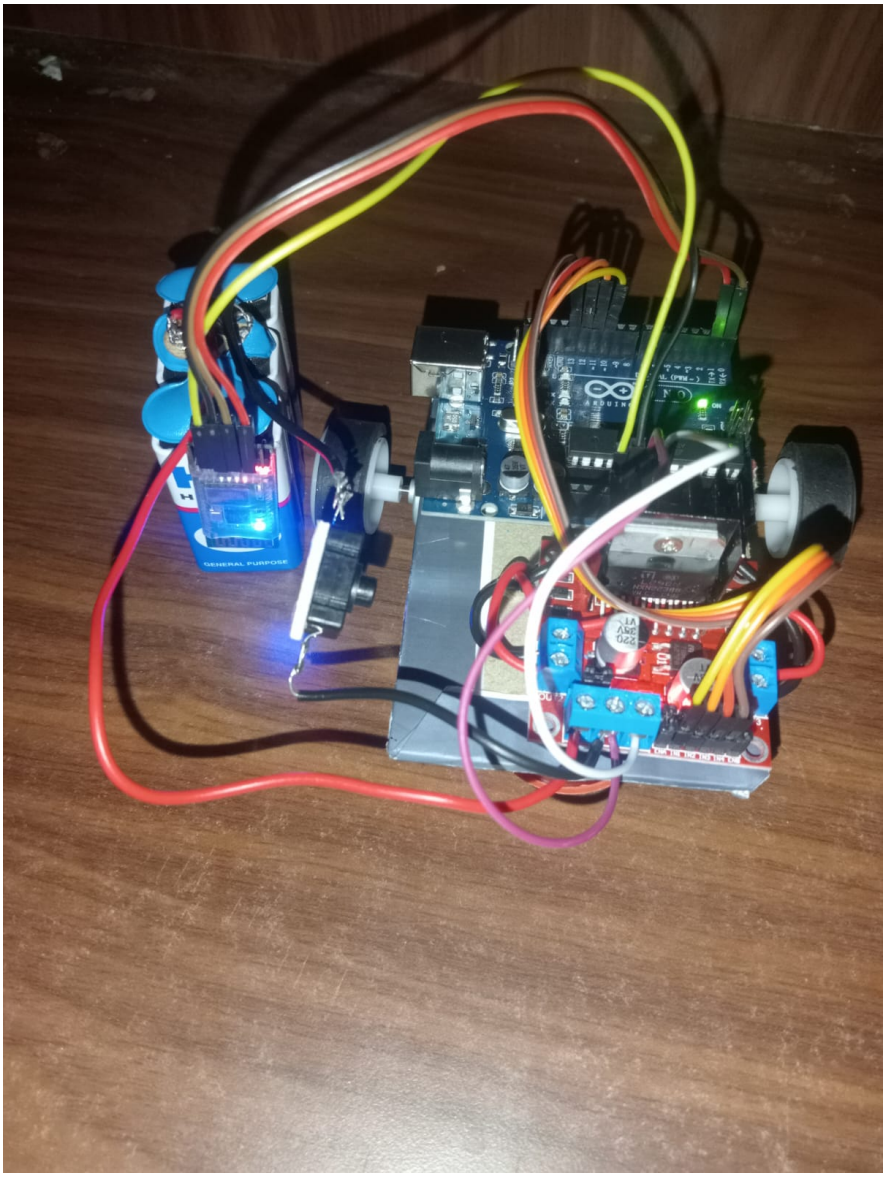

Figure 4.3: Wheel chair

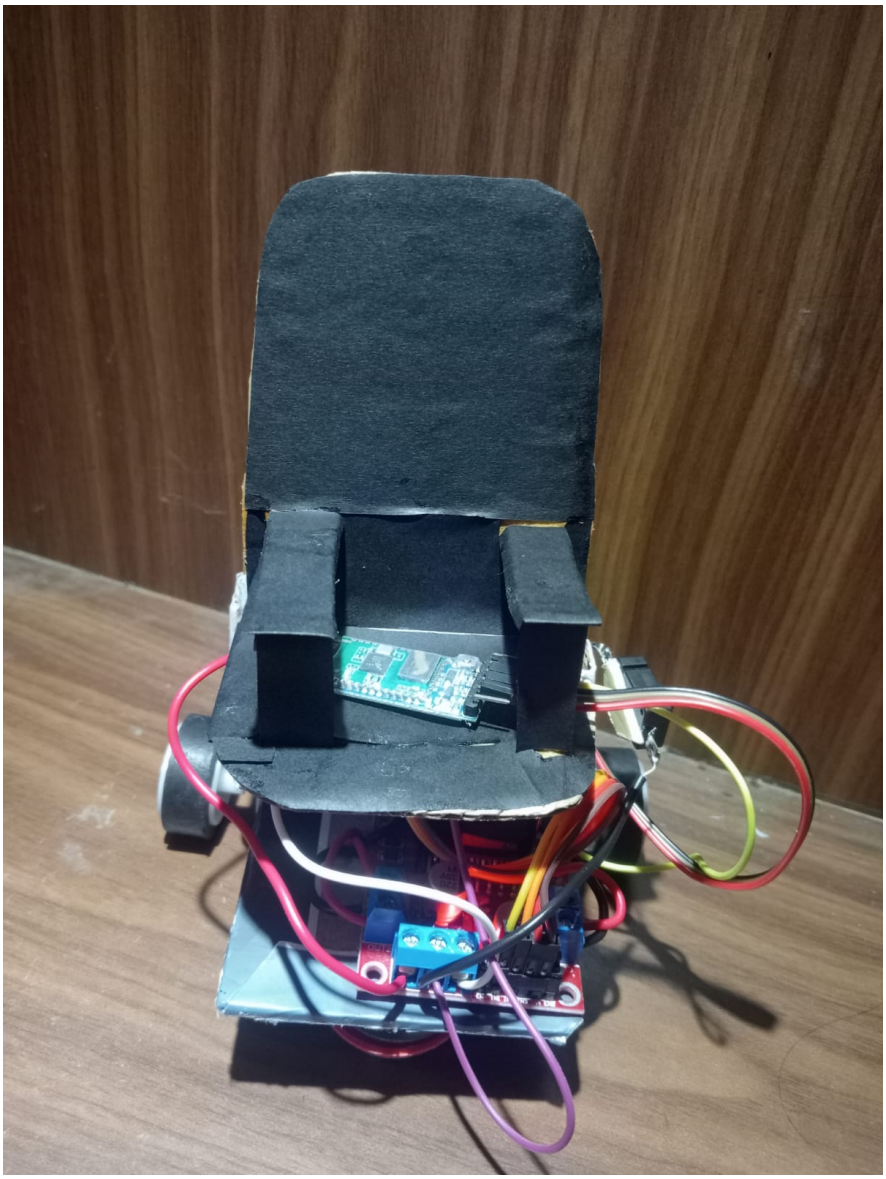

Figure 4.4: Wheel chair

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